

IN THE CLAIMS:

Please amend Claims 1-6, 8-11, 13-19, 21-23, 26-27, 29, 31, 34-37, and 40. The current claims and their status are presented below:

1. (Currently Amended) In a vehicle having occupant protection means for protecting an occupant of said vehicle and a microprocessor for controlling said occupant protection means, the improvement comprising:

a vehicle seat comprising sensing means for providing sensor data for ascertaining sufficient with knowledge of the vehicle geometry for calculating the position location of a part of an occupant of said seat with respect to a reference frame fixed with respect to the structure of said vehicle, and

~~a calculator adapted to calculate said position of said occupant of said seat from input comprising said data, and~~

means for ~~transmitting said position of said occupant of said seat to~~ enabling said sensor data to influence said microprocessor in its said controlling said occupant protection means.

2. (Currently Amended) The invention as defined by Claim 1 wherein said seat comprises a seat back and a seat cushion, and said sensing means comprises:

one or more sensors for providing data ~~for ascertaining~~ enabling the position location of said seat back and said seat cushion with respect to said reference frame to be calculated, and

one or more sensors for providing data ~~for ascertaining~~
enabling the position location of said part of said occupant of said seat
with respect to said seat back and said seat cushion to be calculated,
whereby

said sensor data comprises: said data enabling the
location of said seat back and seat cushion with respect to said reference
frame to be calculated, and said data enabling the location of said part
of said occupant of said seat with respect to said seat back and said seat
cushion to be calculated.

3. (Currently Amended) The invention as defined by
Claim 2 wherein:

said seat is movable on a seat track, and

one of said one or more sensors for providing data ~~for~~
~~ascertaining~~ enabling the position location of said seat back and said seat
cushion with respect to said reference frame to be calculated comprises
a position sensor for ~~indicating~~ measuring the position of said seat on
said seat track.

4. (Currently Amended) The invention as defined by
Claim 2 wherein

one of said one or more sensors for providing data ~~for~~
~~ascertaining~~ enabling the position location of said seat back and said seat
cushion with respect to said reference frame to be calculated comprises
~~a sensor~~ an angle sensor for ~~indicating~~ measuring the recline angle of
said seat back.

5. (Currently Amended) The invention as defined by Claim 2 wherein one of said one or more sensors for providing data for ~~ascertaining~~ enabling the ~~position~~ location of said part of said seat occupant with respect to said seat back and said seat cushion to be calculated comprises:

a first capacitor electrode, a second capacitor electrode,
and

a sensor responsive to the capacitance between said first capacitor electrode and said second capacitor electrode.

6. (Currently Amended) The invention as defined by Claim 2 wherein said one or more sensors for providing data for ~~ascertaining~~ enabling the ~~position~~ location of said part of said seat occupant with respect to said seat back and said seat cushion to be calculated comprises:

a first capacitor electrode and a second capacitor electrode electrically insulated from each other,

means for applying an alternating ~~electric~~ voltage between said first capacitor electrode and said second capacitor electrode, and

a sensor responsive to displacement current between said first capacitor electrode and said second capacitor electrode.

7. (Original) The invention as defined by Claim 6 wherein

said sensor responsive to displacement current comprises:

a resistor connected so that said displacement current passes through said resistor, and

voltage sensing means responsive to voltage across said resistor.

8. (Currently Amended) The invention as defined by Claim 2 wherein

said one or more sensors for providing data for ~~ascertaining~~ enabling the ~~position~~ location of said ~~part of said~~ occupant of said seat with respect to said seat back and said seat cushion ~~comprises~~ to be calculated comprises:

a first sensor for ~~providing first data for ascertaining~~ measuring a first distance between ~~a first location on~~ the back of said occupant of said seat and a ~~second~~ first location on said seat back.

9. (Currently Amended) The invention as defined by Claim 8 wherein said first sensor for ~~providing first data for ascertaining~~ measuring a first distance comprises:

a first seat back capacitor electrode in said seat back,

a first seat cushion capacitor electrode in said seat cushion, and

a sensor responsive to capacitance between said first seat back capacitor electrode and said first seat cushion capacitor electrode.

10. (Currently Amended) The invention as defined by Claim 8 wherein:

said one or more sensors for providing data for ~~ascertaining~~ enabling the ~~position~~ location of said ~~part of said~~ occupant of said seat with respect to said seat back and said seat cushion to be calculated comprises

a second sensor for ~~providing second data for ascertaining~~ measuring a second distance between a ~~third location on~~ the back of said occupant of said seat and a ~~fourth~~ second location on said seat back comprising:

a second seat back capacitor electrode in said seat back,
and

a sensor responsive to capacitance between said second seat back capacitor electrode and said first seat cushion capacitor electrode in said seat cushion.

11. (Currently Amended) The invention as defined by Claim 10 10, and including a calculator connected to receive said sensor data, and wherein:

said calculator is adapted to calculate use said first distance ~~from said first data, said first distance defining to define~~ a first point forward of said seat back,

said calculator is adapted to calculate use said second distance ~~from said second data, said second distance defining to define~~ a second point forward of said seat back,

said calculator uses said two points to define in said reference frame fixed with respect to the structure of said vehicle a plane surface having intersecting said first point and second ~~point thereon,~~ point and also ~~having thereon containing~~ a horizontal line extending transverse to the direction of forward movement of said vehicle, and

said calculator is adapted to use said sensor data to calculate said position location of said part of an occupant of said seat ~~calculated by said calculator is the position by calculating the location of~~ the back of a human having thighs adjacent against said seat cushion and a back adjacent against said plane surface.

12. (Original) The invention as defined by Claim 11, and including

a weight sensor responsive to the weight of said seat occupant, and wherein

said calculator is adapted to assume said occupant of said seat is a human having average dimensions of humans having the weight estimated by said weight sensor when human dimensions are relevant to its calculations.

13. (Currently Amended) The invention as defined by Claim 8 ~~wherein said first~~ wherein said first sensor comprises:

a first emitter for generating a first sound, a first receiver for receiving an echo of said first sound, and a timer for measuring the time between when said first sound is generated and the time when said echo of said first sound is received.

14. (Currently Amended) The invention as defined by Claim 8 wherein

said one or more sensors for providing data for ~~ascertaining~~ enabling the position ~~location~~ of said part of said occupant of said seat with respect to said seat back and said seat cushion to be calculated comprises

a second sensor for ~~providing second data for ascertaining~~ measuring said first distance, whereby

~~data---are---provided---for---making~~ two independent ~~ascertainments~~ measurements are provided of said first distance between ~~a location on~~ the back of said seat occupant ~~and a~~ said first location on said seat back.

15. (Currently Amended) The invention as defined by Claim 14 wherein said second sensor for providing second data comprises:

a second emitter for generating a second sound, a second receiver for receiving an echo of said second sound, and a timer for measuring the time between when said second sound is generated and the time when said echo of said second sound is received.

16. (Currently Amended) The invention as defined by Claim 14 14, and including a calculator connected to receive said sensor data, and wherein:

said calculator is adapted to calculate a first occupant position from one of said ~~first data~~, two independent measurements,

said calculator is also adapted to calculate a second occupant position from the other of said ~~second data~~, two independent measurements, and

said calculator is adapted to use said first and second occupant positions when calculating said ~~position~~ location of said part of said occupant of said seat with ~~respect to a~~ respect to said reference frame.

17. (Currently Amended) The invention as defined by Claim 14 14, and including a calculator connected to receive said sensor data, and wherein:

~~said first data for ascertaining~~ said first distance measured by said first sensor is used for said ~~ascertaining~~ calculating the ~~position~~ location of said part of said seat occupant with respect to said seat back and said seat cushion when ~~said first distance is one of said measurements indicates~~ less than a predetermined distance, and

~~said second data for ascertaining~~ said first distance measured by said second sensor is used for said ~~ascertaining~~ calculating the ~~position~~ location of said part of said seat occupant with respect to said seat back and said seat cushion when ~~said first distance is one of said measurements indicates~~ greater than said predetermined distance.

18. (Currently Amended) The invention as defined by Claim 1, and including a calculator adapted to receive said sensor data, and an accelerometer responsive to ~~decelerations~~ deceleration resulting from a crash, and wherein:

~~said calculator is adapted to receive~~ sensor data includes values of said ~~decelerations~~ deceleration from said accelerometer and said calculator is also adapted for computing values of the second integral of said deceleration as said crash progresses, and

said calculator is also adapted to calculate said location of a part of said seat occupant, and to use said values of said second integral when said calculating said position location of an occupant a part of said occupant of said seat with respect to a respect to said reference frame fixed with respect to the structure of said vehicle.

19. (Currently Amended) The invention as defined by ~~Claim 18, and Claim 18~~ wherein:

said calculator comprises means for calculating the velocity of said part of said occupant of said seat with ~~respect to a~~ respect to said reference frame fixed with respect to the structure of said vehicle from input comprising said sensor data, and

said calculator is adapted to use said velocity when said calculating said ~~position~~ location of an ~~a~~ part of said occupant of said seat with ~~respect to a~~ respect to said reference frame fixed with respect to the structure of said vehicle.

20. (Original) The invention as defined by Claim 18, and including

a seat belt for restraining an occupant of said seat, and wherein:

said seat belt comprises a latch,

said latch is adapted to provide a seat belt latched signal indicating if said seat belt latch is or is not latched, and

said calculator is adapted to said use said values of said second integral only when said seat belt latched signal indicates said seat belt is not latched.

21. (Currently Amended) The invention as defined by Claim 8, and including a calculator adapted to receive said sensor data, and an accelerometer responsive to ~~decelerations~~ deceleration resulting from a crash, and wherein:

said calculator is connected for receiving values of said deceleration from said accelerometer and said calculator is also adapted for computing values of the second integral of said deceleration as said crash progresses, and

said calculator is also adapted to calculate said location of a part of said seat occupant, and to use said values of said second integral when said calculating said ~~position~~ location of ~~an occupant~~ a part of said occupant of said seat with ~~respect to a~~ respect to said reference frame fixed with respect to the structure of said vehicle.

22. (Currently Amended) The invention as defined by ~~Claim 18, and~~ Claim 18 wherein:

said calculator comprises means for calculating the velocity of said occupant of said seat with ~~respect to a~~ respect to said reference frame fixed with respect to the structure of said vehicle, and

said calculator is adapted to transmit said velocity to said microprocessor.

23. (Currently Amended) The invention as defined by Claim 8, ~~wherein~~ 8 wherein

said one or more sensors for providing data for ~~ascertaining~~ enabling the ~~position~~ location of said ~~part of said occupant~~ of said seat occupant with respect to said seat back and said seat cushion to be calculated comprises

a second sensor for ~~providing second data for ascertaining~~ measuring a second distance between the back of said seat occupant and a second location on said seat back, and wherein:

~~said calculator is adapted to ascertain said first distance from said first data and said second distance from said second data;~~

said calculator is adapted to use said first distance and said second distance to define two points in a reference frame fixed with respect to the structure of said vehicle,

said two points define a plane surface containing said two points and a horizontal line extending transverse to the direction of forward movement of said vehicle, and

said calculator calculates said ~~position~~ location of ~~a part~~ of an occupant of said seat with respect to a reference frame fixed with respect to the structure of said vehicle to be the ~~position~~ location of ~~the~~ torso of a human having thighs ~~adjacent~~ against said seat cushion and a back ~~adjacent~~ against said plane surface.

24. (Original) In a vehicle having occupant protection means for protecting an occupant of said vehicle and a microprocessor for controlling said occupant protection means, the improvement comprising:

a vehicle seat comprising a seat back, a seat cushion, and an occupant sensor responsive to distance from a location on said seat to a location on said occupant by producing a first signal categorizing an occupant of said seat into one of at least three categories, and wherein

said microprocessor is responsive to said first signal when controlling said occupant protection means.

25. (Original) The invention as defined by Claim 24 wherein said occupant sensor comprises:

a first capacitor electrode, a second capacitor electrode, and

a sensor responsive to the capacitance between said first capacitor electrode and said second capacitor electrode.

26. (Currently Amended) The invention as defined by Claim 24 wherein said occupant sensor comprises:

a first capacitor electrode and a second capacitor electrode electrically insulated from each other,

means for applying an alternating electric voltage between said first capacitor electrode and said second capacitor electrode, and

a sensor responsive to displacement current between said first capacitor electrode and said second capacitor electrode.

27. (Currently Amended) The invention as defined by Claim 26 wherein said sensor responsive to displacement current is responsive to both the magnitude and phase of said displacement current relative to the magnitude and phase of said alternating voltage, whereby

said occupant sensor is responsive to both the magnitude and Q of capacitance between said capacitor electrodes.

28. (Original) The invention as defined by Claim 26 wherein said sensor responsive to displacement current comprises:

a resistor connected so that said displacement current passes through said resistor, and

voltage sensing means responsive to voltage across said resistor.

29. (Currently Amended) The invention as defined by Claim 24 ~~including:~~ 24, and including

a second occupant sensor responsive to distance from a second location on said seat to a second location on an occupant by producing a second signal, and wherein

said microprocessor is responsive to said first signal and said second signal when controlling said occupant protection means.

30. (Original) The invention as defined by Claim 24 wherein

said categorizing an occupant of said seat into one of at least three categories is into categories of occupant position.

31. (Currently Amended) In a vehicle having occupant protection means for protecting an occupant of said vehicle and decision making means for controlling said occupant protection means, the improvement comprising:

a vehicle seat comprising capacitor electrodes,

seat occupant categorizing means ~~responsive--to capacitance between said capacitor electrodes by~~ for categorizing an occupant of said seat into one of at least three categories, and

means for transmitting said category to said decision making ~~means.~~ means, and wherein

said seat occupant categorizing means is responsive to capacitance between said capacitor electrodes when said categorizing.

32. (Original) The invention as defined by Claim 31 wherein said seat occupant categorizing means is responsive to both the magnitude and Q of said capacitance between said capacitor electrodes.

33. (Original) The invention as defined by Claim 31 wherein said seat comprises a seat back and a seat cushion, and

said capacitor electrodes comprise a seat back capacitor electrode in said seat back and a seat cushion capacitor electrode in said seat cushion.

34. (Currently Amended) The invention as defined by Claim 31 ~~wherein~~ wherein:

said seat comprises a capacitor comprising a first said capacitor electrode and a second said capacitor electrode.

said seat occupant categorizing means causes displacement current to flow ~~between~~ through said capacitor by applying an alternating voltage between said first said capacitor electrode and said second said capacitor electrodes, electrode, and

said seat occupant categorizing means is responsive to said displacement current by when said categorizing said occupant of said seat into said one of at least three categories.

35. (Currently Amended) The invention as defined by Claim 34 ~~wherein~~ 31 wherein:

said seat occupant categorizing means causes displacement current to flow between said capacitor electrodes, and

said seat occupant categorizing means is responsive to ~~both the magnitude and phase of said displacement current, whereby~~

~~said seat occupant categorizing means is responsive to both the magnitude and Q of said capacitance between said capacitor electrodes.~~ current by said categorizing said occupant of said seat into said one of at least three categories.

36. (Currently Amended) The invention as defined by Claim 34 35 wherein:

said seat comprises a capacitor comprising a first said capacitor electrode and a second said capacitor electrode, and

said seat occupant categorizing means causes said displacement current to flow through said capacitor by applying an alternating ~~electric~~ voltage between said first said capacitor electrode and said second said capacitor electrode. electrode, and

said seat occupant categorizing means is responsive to both the magnitude and phase of said displacement current relative to said alternating voltage when said categorizing said occupant of said seat into one of at least three categories, whereby

said seat occupant categorizing means is responsive to both the magnitude and Q of said capacitor.

37. (Currently Amended) The invention as defined by Claim 34 35 wherein said seat occupant categorizing means ~~comprises:~~ comprises

~~a resistor connected so that~~ current sensing means for providing a measurement of said displacement current ~~passes through said resistor, current, and wherein~~

said occupant categorizing means is responsive to said measurement of said displacement current ~~by responding to voltage across said resistor by~~ when said categorizing said occupant of said seat into said one of at least three categories.

38. (Original) In a vehicle having occupant protection means for protecting an occupant of said vehicle and decision making means for controlling said occupant protection means, the improvement comprising:

a vehicle seat comprising capacitor electrodes,

means for causing displacement current to flow between said capacitor electrodes,

means responsive to said displacement current by categorizing an occupant of said seat into one of at least three categories, and

means for transmitting said category to said decision making means.

39. (Original) The invention as defined by Claim 38 wherein said seat occupant categorizing means is responsive to both the magnitude and phase of said displacement current, whereby

said occupant categorizing means is responsive to both the magnitude and Q of said capacitance between said capacitor electrodes.

40. (Currently Amended) The invention as defined by Claim 38 wherein:

said seat comprises a first capacitor electrode and a second capacitor electrode, and

said means for causing displacement current comprises means for applying an alternating electric voltage between said first capacitor electrode and said second capacitor electrode.

41. (Original) The invention as defined by Claim 38 wherein said seat comprises a seat back and a seat cushion, and

said capacitor electrodes comprise a seat back capacitor electrode in said seat back and a seat cushion capacitor electrode in said seat cushion.

42. (Original) The invention as defined by Claim 38 wherein a said capacitor electrode comprises fabric which has been adapted to be electrically conductive.

43. (Original) The invention as defined by Claim 38 wherein said seat occupant categorizing means comprises:

a resistor connected so that said displacement current passes through said resistor, and

said means responsive to said displacement current is responsive to voltage across said resistor by said categorizing an occupant of said seat into one of at least three categories.

44. (Original) The invention as defined by Claim 38 wherein

said categorizing an occupant of said seat into one of at least three categories is into categories of occupant position.